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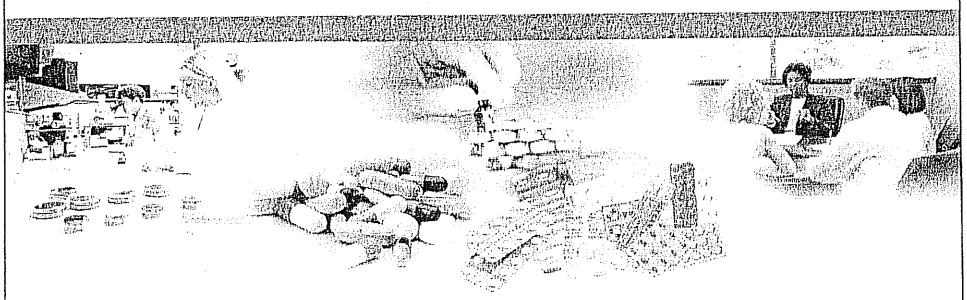

Cardinal Health RFID Pilot Results

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Agenda

- RFID Pilot
  - Overview
  - Results
  - Conclusion

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Pilot Overview

- Background
  - In 2004
    - Adoption of direct-distribution model
    - Develop an offering of authentication and track & trace technologies aimed at further securing supply-chain
    - Participated in first industry-wide RFID testing (Jumpstart 1)
  - In 2005
    - Collaborated with industry in RFID planning process (Jumpstart 2)
    - Began integrated effort between manufacturing / packaging and distribution businesses to develop an RFID solution
    - Solicited and received proposals from technology leaders
      - » Hardware
      - » Software (Middleware & Pedigree)
      - » Project Management
    - Met with various potential customers to gain knowledge on brand security/ RFID internal efforts
  - In 2006
    - Executed pilot

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RFID Pilot Objectives

- Optimize tagging operations
  - Considerations for inbound bulk drum tagged by manufacturer
  - Integrate printed component tag application into packaging operations
- Gather production data for internal and external publication
  - Determine read rate accuracy
  - Determine impact to current production processes & opportunities for improvement
  - Evaluate Cost impact of multiple facility scale-up
  - Establish infrastructure to provide feedback to manufacturers
  - Share results with legislative bodies regarding readability and possible effects on current cGMP/ regulatory practices.

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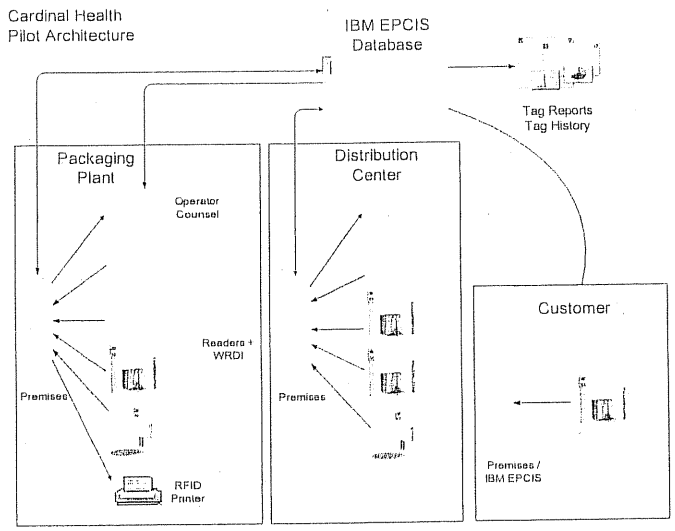
Architecture For Interoperability



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Definitions

- Aggregation: the collecting of individual units into a whole; a massing together or clustering of independent but similar units[1]
  - For example: 12 units = 1 case
    100 cases = 1 pallet
- Commission: the act of granting certain powers or authority to carry out a particular task or duty[2]
  - For example: RFID Tag is granted permission to carry data for a specific organization
- Inference: the act or process of deriving logical conclusions from premises known or assumed to be true; the act of reasoning from factual knowledge or evidence[3]
  - For example: If a case can be identified, contents are assumed to be known
- Interoperability: the ability to exchange and use information; the capability of being used or operated reciprocally[4]
  - For example: A manufacturer's system sends product information to a wholesaler in a generally accepted standard format

1. "aggregation." *Merriam-Webster's Dictionary of Law*. Merriam-Webster, Inc. 28 Nov. 2006 and *The American Heritage® Stedman's Medical Dictionary*. Copyright © 2002, 2001, 1995 by Houghton Mifflin Company. Published by Houghton Mifflin Company. (Dictionary.com)
2. "commission." *The American Heritage® Dictionary of the English Language, Fourth Edition*. Houghton Mifflin Company, 2004. 28 Nov. 2006. (Dictionary.com)
3. "inference." *The American Heritage® Dictionary of the English Language, Fourth Edition*. Houghton Mifflin Company, 2004. 28 Nov. 2006. (Dictionary.com)
4. "interoperability." *WordNet® 2.0*. Princeton University. 30 Nov. 2006 and "interoperability." *WordNet® 2.0*. Princeton University. 30 Nov. 2006 (Dictionary.com

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RFID Pilot Product Selection

- Non Major Pharma Company
- Product Diversity
  - Tablet Size/ Bottle Size
  - Unit Count
  - Round Bottle Vs Square
- Two Products
  - Rx A – Mid-tier manufacturer
    - Large tablet, 90 count unit, square bottle
    - Production run - 7/7/2006
  - Rx B - Mid-tier manufacturer
    - Small tablet, 90 count unit, round bottle
    - Production run - 7/20/2006

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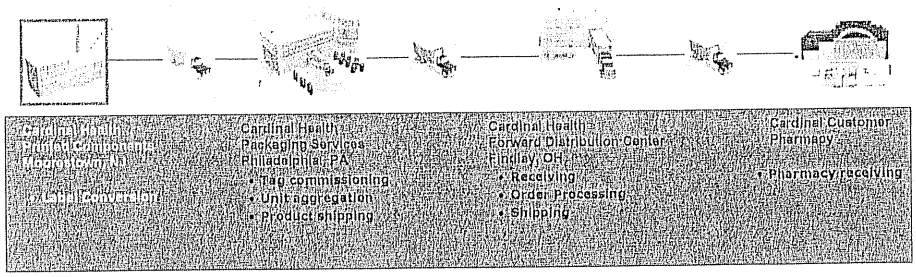
RFID Supply Chain Pilot

- Tagged product will flow through the following process:



- RFID Label Conversion
  - Print labels using existing label processes
    - Located at Cardinal printed component facility
    - Complete label printing and finishing capability
  - RFID tag insertion as a secondary operation

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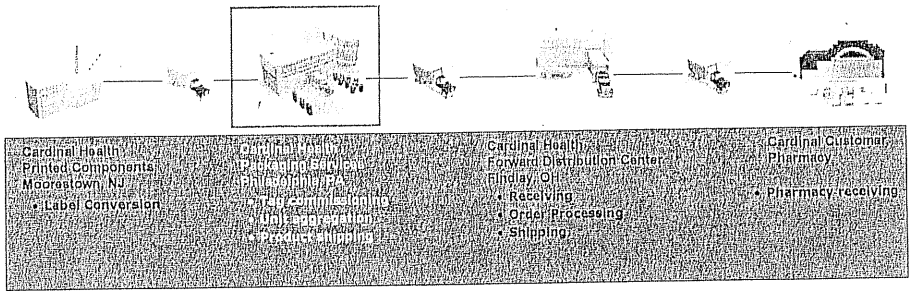
RFID Supply Chain Pilot

- Tagged product will flow through the following process:



- Product Packaging
  - Encoding in-line (read, write, read)
    - NDC & unique serial number is encoded
    - Production speed target – 120 bottles per minute
  - Aggregate units to cases simultaneously in production
  - Aggregate units to cases to pallets simultaneously - shrink wrap station
  - Read units and cases on outbound shipment

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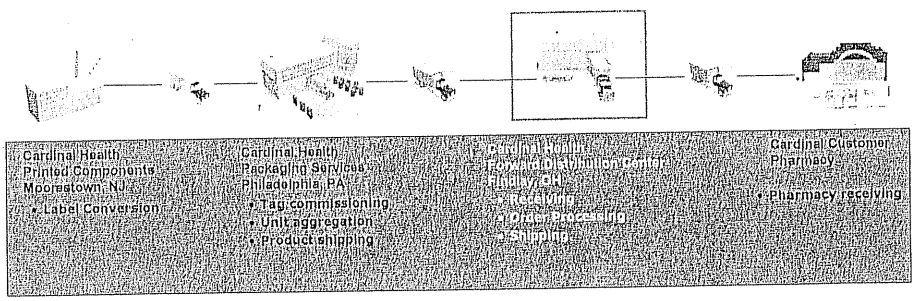
RFID Supply Chain Pilot

- Tagged product will flow through the following process:



- Distribution
  - Read cases and units on pallet at receiving
  - Read cases and units in singular format on conveyor
  - Read units in totes ready for shipment
  - Read units on cart with 30 totes on outbound shipment at shrink wrap
  - Read units on cart on outbound shipment

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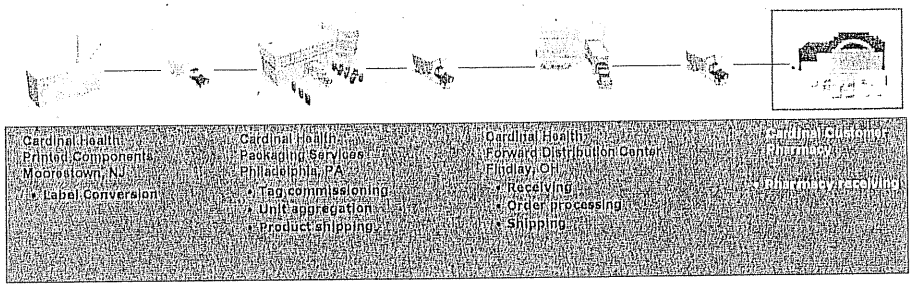
RFID Supply Chain Pilot

- Tagged product will flow through the following process:



- Pharmacy
  - Read units on inbound shipment (cart of 30 totes)

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RFID Pilot Results

Overall Results

Location	Item Level Read Rates		Case Level Read Rates	
	Rx A	Rx B	Rx A	Rx B
Unit encoding yield during packaging	97.7%	94.8%	N/A	N/A
Unit to case aggregation	96.9%	99.7%	91.8%	100%
Case to pallet aggregation	56.4%	80.8%	100%	99.7%
Packaging shipping	9.2%	14.3%	82.3%	100%
Distribution Center pallet receiving	7.8%	9.5%	76.3%	100%
Distribution Center case receiving	92.1%	97.1%	99.4%	100%
Distribution Center customer QC	N/A	99.6%	N/A	
Distribution Center turntable	N/A	64.2%	N/A	
Distribution Center shipping	N/A	47.1%	N/A	
Customer receiving	N/A	88.2%	N/A	

Represents best opportunity for RFID tag reads

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Read Rate Conclusions

- Overall
  - RFID tags can be successfully inlaid under existing FDA-approved pharmaceutical label stock
  - Packaging lines can be run at validated speeds while encoding and verifying RFID tag application
  - A single frequency (UHF) has the potential to work in critical points from pharmaceutical packaging to pharmacy receipt
  - No tag failures were encountered in any stage of the pilot

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Read Rate Conclusions

- Units
  - Item-level reads are not possible when cases are stacked on a pallet
  - Unit read rates within mixed totes are highly reliable (>99%) but have not achieved six sigma quality

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Read Rate Conclusions

- Cases
  - 100% read rates of case tags on a full pallet are potentially obtainable, but further testing is needed
  - Case read rates on a moving conveyor at shipping and receiving had read rates in excess of 99%

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Overall Conclusions

- RFID technology is feasible for "Tracking & Tracing" item level drugs in the pharmaceutical supply chain provided the following conditions and processes are met:
  - Item level reads are limited to individual each and case read processes with conditions managed to an ideal / consistent state
  - Inference is allowed to become an acceptable practice in the normal distribution process schemes
  - Full interoperability of systems from manufacturer to pharmacy
  - Barcode technology is used in a redundant / complementary strategy to allow "Track & Trace" in areas of privacy concerns, biologic product distribution and RFID tag failure
  - Implementation is measured and managed in a manner consistent with the technology capability, the compliance risk and the financial impact on individual stakeholders
  - Higher levels of collaboration are initiated among stakeholders to identify opportunities in the supply chain to significantly improve efficiencies and reduce costs

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